Makers have provided us with tiny cameras fitted with lenses of enormous rapidity and exquisite defining power, and rollfilms of such quality, speed and color sensitivity as were undreamed of by our predecessors, that the intelligent beginner starts level, as far as the attainment of technical excellence is concerned, with the advanced worker of yester-year.

The beginner differs only in this: he is nebulous in his aspirations; he lacks the artistic training of the pictorialist; and he is reluctant to learn the fundamentals of photography.

General and appealing advantages are the compactness, portability, and self-containedness of these miniature cameras.

Within the space of a few square inches the photographer can carry at all times, in a soft pocket purse or in an ever-ready case slung from the neck, a fully equipped instrument furnished with a single roll of film for twelve, sixteen or thirty-six exposures without reloading and ready for instant use.

The facility of immediate operation is, however, of practical value only when a camera is so optically endowed as to make the registration of the subject effectively on the film, irrespective of prevailing light conditions, regardless of the rapidity with which the subject is moving, and in despite of the amount of depth of field definition the photographer desires.

For this purpose the lens must possess great light-passing power; so it must be of very large aperture; and it must at the same time have great depth of critical definition in order that planes before and behind the principal object focussed sharply, shall be rendered recognizable in reasonably big enlargements.

Good depth of definition and great lens rapidity are, however, incompatible unless the focal length of the lens is short. Hence, these two indispensable qualities can be secured in the miniature camera only, which is equipped as a standard with a lens of five or six centimetres focal length and of nominal rapidity F3.5, F2.9, and F2.

With even this last aperture a satisfactory depth of field can be secured without stopping down, thus allowing sixteen times the light intensity at the film surface as that given by a lens working at F8.

This advantage of miniature cameras under conditions where the utmost light action must be secured in photographing rapidly moving objects when the illumination is far from brilliant needs no stressing.

In the matter of running costs, once the user has mastered the operating of the camera and is able to handle it with the certainty that comes of practice, the expense is small, the cost of each negative being little more than 2 cents assuming the use of higher priced films and including the cost of developing and fixing them.

MODERN HIGH-SPEED FILMS AND SOME OF THEIR SPECIAL CHARACTERISTICS:

Verichrome.—Highly sensitive to greens and yellows, almost approaching panchromatic in this respect. Excellent for skies and clouds and portraits of dark persons. Ideal for photographs including naked lights.

Selochrome.—A fine film for general miniature work. For portraits of very fair people, when used with a pale light filter, gives excellent color values.

Agfa Isochrom.—One of the best films for good contrast on dull days and in winter. Develops quickly.

Zeiss Ikon, Mimosa and Perutz Fine Grain.—Specially advantageous for copying and where large commercial and technical prints are wanted.

Gevart Express.—An exceedingly rapid film particularly effective in rapid action sports work.

Perutz Persenso, Agfa and Kodak Super Ban.—Are especially indicated for outdoor night snapshots and snapshots of stage incidents.

Zeiss Ikon U.R. Pernox Film.—Has the amazing speed of 2500 H. and D. to daylight and is fully sensitive to yellows and greens. For rapid action work near or at sunset, it will secure fully timed exposures. For ordinary outdoor snaps during the summer months one twenty-fifth second can be given with the lens at F22 or at F8 the same exposure with an eight times light filter on the lens. Using this film with a lens of F2.8 snapshots indoors can be made in ordinary well-lighted rooms.

IMPORTANT POINTS ABOUT LENSES:

Lens F3.5 with 2 inch Focal Length.—For general, all around photography, sufficiently rapid, exquisite definition, allows of enlargements to any practical dimensions.

Wide angle lens F3.5 with 3.5 centimeters focal length. Useful for interiors, confined situations, architectural subjects in narrow streets.

Lens F1.9 with 73 mm. Focal Length.—Valuable for very large heads stage and night snapshots. The image given by this lens possesses a fine "soft-sharp" quality when taken with full aperture, particularly effective in portrait work.

Lens F6.3 with 4 inch Focal Length. (not telephoto type).—A useful lens for Alpine and other mountainous regions. Light in weight and gives a more imposing rendering of distant mountains (four times the area) than standard 2 inch lens.

Lens F4.5 with 13.5 centimeters Focal Length (not telephoto type).—A fine long focus supplement lens for distance, sports pictures and groups. Definition at full aperture very good.

Lens F2. with 5 centimeters Focal Length.—This lens gives most remarkable definition at its full aperture, combining enormous speed with absolutely needly sharp definition over the whole negative area. Invaluable where very big enlargements must be made from negatives taken under difficult lighting conditions and requiring rapid exposures.

Lens F4.5 with 13.4 centimeters Focal Length.—This lens, similar in application to the 13.4 centimeter lens, has a greater resolving power than the latter. It has been designed for infra-red photography of distant scenes and for archaeological and architectural work demanding the keenest definition and detail in the small negatives. In conjunction with Perutz fine grain film the negatives yielded seem to have no limit in enlarging, the magnification can be taken so high as to reveal the grain, even in the fine grain films, without losing the image structure.

Lens F3.4 and F2.8.—For general photography. It is unnecessary to remark on the perfect correction and needle-sharp defining quality of this famous lens. Lenses F2 and F1.5 with 2 inch focal length are not inferior to this lens in correction and definition. Their high speeds are valuable for night photography and when stopped down, they are as good as this F3.4 and F2.8 lenses for general work.

Lens F4 with 3¼ inch Focal Length.—A useful medium long focus lens for big heads and general indoor and studio portraiture. Rapid enough for high speed work at 1/1000 second when one cannot approach closely to the performers.

Lens F4 with 5⅜ inches Focal Length.—A rapid long focus lens, particularly useful for high speed sports work in securing a large image on the film from the spectators' enclosure. As a supplementary lens for general narrow angle pictures like street groups, while keeping well distant from ones subjects, this lens is highly desirable as supporting the regular 2 inch lens. Since it gives an image equivalent in view angle to a 15 inch focal length telelens on a ¼ plate reflex, its value will be self-evident.

The lens F3.4 and F2.8 has a sliding mask which can be brought in front of the finder lens, and which then shows a facsimile of the reduced view falling on the film when the 5⅜ lens is in use.

Lens F6.3 with 7 inch Focus.—This lens, equivalent in use to a 20 inch telelens on a ¼ plate will be found useful for photographing distant villages from mountain heights and conversely for big-scale snapshots of mountain climbers taken from the ground.

When using lenses of 5 inches or longer focal length, it is always best, whenever possible, to support the camera on a tripod; this obviates vibration and insures the correct placing of the subject on the film. A slight movement of the camera when the normal lens is employed may not cut off any essential part of the subject. When a long focus lens is in use, the image moves much more rapidly as the camera is moved, and the loss of some important feature may easily occur, unnoticed.

If the camera must be held in the hands the fingers should firmly support the lens mounting, a fairly rapid speed be dialed, and a careful observance of the finder image should be maintained until the exposure has been made.

DEPTH TABLE FOR AMATEUR CINE CAMERAS

CALCULATED FOR A LENS OF 1 INCH (25 mm.) FOCUS AND A DISC OF CONFUSION OF 0.001 INCH

Distance focussed on	f/1.9	f/2.8	f/3.5	f/4	f/5.6	f/8	f/11	f/16
100	30 – inf.	23 – inf.	19 – inf.	17 – inf.	13 – inf.	9 – inf.	7 – inf.	5 – inf.
50	23 – inf.	18 – inf.	16 – inf.	14 – inf.	11 – inf.	8½ – inf.	6½ – inf.	4¾ – inf.
25	16 – 38	13½ – inf.	12 – inf.	11 – inf.	9¼ – inf.	7⅓ – inf.	5¾ – inf.	4¼ – inf.
15	11 – 22	10 – 30	9 – 40	8 – 55	7½ – inf.	6 – inf.	5 – inf.	3¾ – inf.
10	8 – 13	7⅓ – 15	7 – 17	6¾ – 19	6 – 30	5 – inf.	4 – inf.	3½ – inf.
8	6¾ – 10	6⅓ – 11	6 – 12	5¾ – 13	5¼ – 17	4½ – 36	3¾ – inf.	3¼ – inf.
6	5¼ – 7	5 – 7½	4¾ – 8	4⅔ – 8½	4¼ – 10	3¾ – 14	3⅓ – 31	2¾ – inf.
4	3¾ – 4½	3½ – 4⅔	3⅓ – 4¾	3¼ – 5	3 – 5½	2¾ – 6½	2½ – 8¾	2¼ – 18
3	2' 10"–3' 2"	2' 9"–3' 4"	2' 8"–3' 5"	2' 7"–3' 6"	2' 6"–3' 9"	2' 4"–4' 6"	2' 0"–5' 0"	1¾ – 7
2	23"– 25"	22½"– 25½"	22"– 26"	21½"– 27"	21"– 28"	20"– 30 "	19" – 33"	17"– 40"

Lens 1¹⁄₁₆ inch Focal Length.—Valuable for interiors and confined situations. The remarkable exquisite defining power of the lens has been recognized and appreciated, as well as its covering power over a very wide angle, for many years.

F3.4 and F2.8 negatives made with this lens, using Zeiss Ikon special fine grain film, will stand an almost incredible degree of enlargement.

The F3.4 and F2.8 and the 1¹⁄₁₆ inch focal length will slip into the pocket, and 15 by 12 enlargements from negatives taken with a 15 by 12 stand camera and a 12 inch W.A. Anastigmat.

Architectural enthusiasts and commercial photographers can produce, with the miniature equipment just mentioned, results that can stand up to the best work produced in bygone days, with heavy and ponderous outfits.

The Eastman Kodak Company of Rochester has an assortment of high-speed lenses to fit all the requirements of the small miniature cameras. And the full range of lenses they have will efficiently cover the subjects and work already outlined by the writer.

After you have studied over the information regarding lenses already related by the writer, it will act as a guide in the purchase of your next camera or lens.

HOW TO PRINT PICTURES ON LETTERHEADS AND IN SCHOOL BOOKS

Here is a simple process that can be done dry without any mess and can be swabbed with hypo as a fixer if the picture is going to be exposed to strong light.

Gelatin	180 grains
Ammonium chloride.	17 grains
Sodium tartrate	50 grains
Silver nitrate	78 grains
Alcohol	4 drams
Water	5 ounces

Put the gelatin in the water, and allow it to soak for 15 minutes. Then heat the solution to a temperature of 100° F. and add the other ingredients in the order stated above. Pour into dark amber bottles and keep well corked when not in use. Caution: Mixing the above solution should be done under red light or a dim orange light. To use, simply rub a little of the solution on the paper and allow to dry. Place your negative over the sensitized portion and a piece of clean glass over the negative to hold it in contact with the sensitized paper. Two pieces of glass may be used to make a printing frame by placing the negative and the sensitized paper between the two pieces of glass and securing the latter together with spring-clip clothes pins. Expose to sunlight

for about two minutes. A photoflood lamp requires a slightly longer exposure.

The process described above has been used in printing pictures on the pages of a book without detaching the leaves or pages from the book. If the photograph so made is to be exposed to light very much, it should be swapped over lightly with a piece of absorbent cotton and a hypo solution (1 ounce of hypo to 3 ounces of water).

HOW TO ENLARGE PICTURES DIRECT ON WALLBOARD OR WALLS OF THEATRES AND TAVERNS:

The walls of the theatre or tavern that the picture is to be projected upon should be in good condition as to the plaster. Cracks should be filled with plaster of Paris or a patching plaster and allowed to dry several days before any of the following operations are begun. Before applying the sensitizer, the wall must have a primary coating of insoluble gelatin. This is made by allowing ½ pound of hard gelatin to soak in one gallon of water for 30 minutes. The mixture is then heated to a temperature of 130° F. and 2 drams of carbolic acid are added to the mixture. This mixture is then painted on the walls and allowed to dry. Some recommend spraying the mixture on the wall and if too thick to operate in a sprayer, thin it by adding an equal amount of warm water and then giving two coats, allowing the first to dry before applying the second.

When the coating is dry, a solution of

Chrome alum	4 ounces
Water	16 ounces
Tannic acid, 10 per cent	1 ounce

is sprayed or washed on the wall. This solution renders the solution insoluble for all subsequent operations.

The formula for a sensitizer for use on walls is the same as the one given previously for Printing on Fabric. It may be purchased at a photographic supply dealer under the trade name "Lerorapid". The sensitizer is applied to the prepared wall surface with a brush from which the metal band or ferrule has been removed. No metal must touch the sensitizer, and it is for this reason that the metal must be removed before using. A brush that has its bristles set in rubber must be used or one in which the bristles are set directly in the wood.

ENLARGEMENTS

TIMES OF ENLARGEMENT AND REDUCTION

Focus of Lens, In.	1 inch	2 inches	3 inches	4 inches	5 inches	6 inches	7 inches	8 inches
2	4 4	6 3	8 2⅔	10 2½	12 2⅖	14 2⅓	16 2⅔	18 2¼
2½	5 5	7½ 3¾	10 3⅓	12½ 3⅛	15 3	17½ 2 9/10	20 2⅔	22½ 2 3/16
3	6 6	9 4½	12 4	15 3¾	18 3⅗	21 3½	24 3⅜	27 3⅜
3½	7 7	10½ 5¼	14 4⅔	17½ 4⅜	21 4⅕	24½ 4 1/12	28 4	31½ 3 9/10
4	8 8	12 6	16 5⅓	20 5	24 4⅘	28 4⅔	32 4⅞	36 4½
4½	9 9	13½ 6¾	18 6	22½ 5⅗	27 5⅖	31½ 5¼	36 5⅛	40½ 5 1/16
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5⅚	40 5⅝	45 5⅝
5½	11 11	16½ 8¼	22 7⅓	27½ 6⅞	33 6½	38½ 6 5/12	44 6⅔	49½ 6 3/16
6	12 12	18 9	24 8	30 7½	36 7⅕	42 7	48 6⅞	54 6¾
7	14 14	21 10½	28 9⅓	35 8¾	42 8⅖	49 8⅛	56 8	63 7⅞
8	16 16	24 12	32 10⅔	40 10	48 9⅗	56 9⅓	64 9⅛	72 9
9	18 18	27 13½	36 12	45 11¼	54 10⅘	63 10½	72 10⅞	81 10⅛

Application of the sensitizer must be done in dim red light or total darkness. When it has begun to set or dry, the image is projected upon it from the enlarger. The length of exposure depends upon the size of the negative used and the size of the finished print. A negative of normal density, size 8 x 10 inches may be enlarged to about 12 feet in length and will take about 18 minutes of exposure. It is a good idea to have the image already focussed upon the wall before the sensitizer is applied.

Developing is done by spraying the sensitized area with the developer given previously for Copy and Process negatives. It is a good idea to dilute the developer somewhat so that the action will be slowed enough for control. Should the image show signs of over-developing, spray it quickly with a solution of glacial acetic acid 4 ounces mixed in one gallon of water. This stops the developing.

The fixer is then sprayed on. It is:

Hypo	5 pounds
Ammonium chloride	½ pound
Potassium meta-bisulphite	½ pound
Water	1½ gallons

The picture may be washed by spraying with plain water after which it may be toned to any desired color by using one of the toners given in this chapter.

The operations do not require much time and a good operator may complete the entire job in about one hour.

Ordinary Billboard paper may be sensitized and processed the same as above only it is not necessary to give it a preliminary sizing. Pictures are limited in size only by the loss of detail and the increase of exposure time.

MISCELLANEOUS FORMULAS

REVERSAL OF THE IMAGE:

Following the development and after a short washing in running water, immerse the plate in a dish-containing 3 ounces of the reversing solution and take the dish out in full light. The plate which was opaque, clears, and the colors become more and more visible by transmitted light. After half or one-and-a-half minutes, when the plate bears no more trace of negative image, take it out of the dish and wash it for about 30 seconds in running water.

Reversing Solution.—

Potassium permanganate	30 grains (2 grams)
Sulphuric acid	3 drams (10 cubic centimeters)
Water	35 ounces (1000 cubic centimeters)

This solution will keep for a short time, but should not be used if cloudy.

Immediately the plate is covered by the solution daylight may be used.

Second Development.—The plate is then re-developed in full daylight, using the solution which has served for the first development, (kept in the dish without special precautions). When the highlights are completely darkened (about 3 or 4 minutes) the plate is washed for 3 or 4 minutes, and immediately placed to dry. Fixing is unnecessary unless the plate is intensified.

Ground-Glass Varnish.—

Sandarac	90 grains (103 grams)
Mastic	20 grains (23 grams)
Ether (0.720)	2 ounces (1000 cubic centimeters)

Dissolve the resins in the ether and afterwards add

Benzole	½ to 1½ ounces (250-750 cubic centimeters)

The proportion of the benzole added determines the nature of the matt obtained.

This varnish must be applied to the cold negative or the coating will not matt.

Retouching Medium.—

Pale gum resin	200 grains (230 grams)
Gum dammar	90 grains (100 grams)
Gum mastic	20 grains (23 grams)
Oil of juniper	1 dram (60 cubic centimeters)
Oil of turpentine	24 ounces (1000-2000 cubic centimeters)

The gums are powdered and added to the oils, and finally enough pure asphaltum is added to give the mixture a dark amber color when viewed through the depth of an inch.

This formula is strongly recommended as it will not pick, rub off, or come off on after-varnishing. It takes a great deal of work.

DIRECT PRINTING ON METAL:

Before sensitization, the metal plates, previously grained, must be cleaned in an acid bath, to be freed from all traces of superficial oxidation.

Zinc

Alum	2½ ounces
Nitric acid	1 ounce
Water	25 ounces

(About 30 seconds' immersion)

or

Aluminum

100 grams....10 per cent alum solution
40 cubic centimeters. (30 minutes immersion)

or

1000 cubic centimeters 3 per cent fluosilicic acid solution (10 minutes immersion)

They are then rinsed and rapidly dried with a fan or by means of a jet of compressed air, which drives the water away.

The printing may be effected by the bitumen or the bichromated albumen process, but with a few modifications. In order that an image may be used efficiently as a lithographic resist, it must be formed of greasy ink incorporated with the stone or metal, and not merely held in some way on its surface. When the printing has been carried out by the bitumen process, it is then necessary to replace the bitumen by greasy ink everywhere and yet without any encroachment over the parts corresponding to the whites of the image, in which the metal must remain bare. For this purpose, after development of the bitumen print, rinsing and rapid drying, the metal is covered with a somewhat thick solution of gum freshly prepared (to which may be added an aniline dye which will enable its application to be more easily controlled), and this is dried as quickly as possible. When the gum is completely dry, the plate is washed with benzene, which dissolves the bitumen, and is rolled with stone-to-stone retransfer ink thinned to a liquid consistency with turpentine. The solvent is allowed to evaporate, and the plate is washed with water to re-dissolve the gum, which has completely protected the underlying metal from any contact with the ink. The image being now formed of greasy ink, the "etching" and the gumming of the metal may be proceeded with.

Printing by the albumen process as usually practised does not lend itself to photo-metallography, as the comparatively thick coating of insolubilized albumen completely isolates the greasy ink from the metal.

The solution of albumen must be as dilute as possible, while yet permitting the image to be developed without difficulty; on coarse-grained metal it is, however, necessary to use a slightly more concentrated solution. A few preliminary experiments will enable the limit of dilution best suited to each case to be determined.

The "photo-transfer" ink must not be stiffer than is necessary; the following formula gives good results:

Litho writing ink (sticks)	2 parts
Litho retransfer ink	2 parts
Bitumen	1 part
Oil of lavender	1 part

For use this ink must be thinned with benzene or turpentine, but the latter must have been freshly manufactured.

Immediately after development, the metal must be flushed with a freshly prepared 20 per cent solution of gum arabic, the surplus of which is removed with a wet rag, and the plate is then dried rapidly. After this drying, or at any rate within one hour at most, after which time the ink would already be too hard to enable the operations to be proceeded with under satisfactory conditions, the following "washing-out mixture" is spread over the image so as to cover it evenly, but without any unnecessary excess:

Turpentine	40 parts
Litho writing ink	1 part
Powdered bitumen	2 parts

The solvent is now allowed to evaporate, the thin film of ink which formed the original image meanwhile dissolving in the turpentine and forming a new ink, which being very greasy and fluid, has been able to penetrate down to the metal through the very thin coating of albumen, and to give a firm seating to the image. After the greasy liquid is completely dry, the gum is moistened with a wet rag, the plate is rolled up with ordinary lithographic ink, then the metal is "etched," gummed again, and dried rapidly with a fan.

WHAT ARE PERCENTAGE SOLUTIONS?

The usual practice in making a solution to a specified percentage strength is to consider the weight of the substance to be dissolved in relation to the volume of the completed solution. Thus, to make a 10 per cent solution, we dissolve 1 ounce avoirdupois in enough water to make the volume of the solution 10 fluid ounces. If, however, the object is to make a solution of which some sub-division of a fluid ounce will contain a grain or an exact number of grains, then the number of minims or drachms of the completed solution must be an exact multiple of the number of grains dissolved. Thus if 1 ounce avoirdupois of 437.5 grains be dissolved in enough water to make the volume of the solution 4,375 minims (approximately 9 ounces 1 drachm) every 10 minims of the solution will contain 1 grain of the substance.

MOVIE AND REVERSIBLE DEVELOPERS

REVERSAL DEVELOPMENT:

There are many ways of effecting the reversal of development for "movie" projection, and the best formula that does not call for a series of complicated changes is found below.

However, the most popular method is to print another film from the negative roll, this method is recommended by many camera clubs, for the reason that it is fool-proof, and very easily done.

The difference in the price is about 50 cents between the reversal development and the positive print, and this is off-set by the fact that the negative roll is intact and any section can be used for a "blow up" (an enlargement) at any time, whereas if the reversal development is done, one has to make a negative print from the reversed negative (which would be a positive).

A simple device can be made at home for an outlay of a dollar and a few hours work to enable one to print a positive roll from a negative.

Secure a box, or make one (20 inches square and three inches deep). In the two bottom corners, place a small axle and turn handle to hold two spools. From the left hand corner, the film will travel up to another small roller, 6 inches from the side and two inches from the top—the film then travels 8 inches across the box onto another small roller, and from there, down to the empty spool in the left corner of the bottom of the box.

Between the two top small rollers, a hole is cut in the top of the box, and a small paper cylinder inserted (about 2 inches long) and the same size as your film (16 millimeter or 32 millimeter). A small 25 watt reflected bulb is fitted OUTSIDE the box, so as it will show light for the printing to be effected, through the paper cylinder.

Before printing, the positive roll of film and the exposed film has to be re-wound onto the ONE spool. Use a little film cement to make sure that the films will not "slide", and be sure that both films have an equal grip onto the empty spool you are to rewind onto.

Once these spools are wound together, all there has to be done is to treadle the double film from the full spool up onto the small roller across the "light cylinder" over the other small roller and down to the empty spool.

Two complete revolutions per second is about the speed for average negatives (slower if dense, and slightly faster if flat or weak negative roll has to be used).

The steps in the process comprise vigorous development of the negative image; chemically removing the silver; washing the roll with only enough light to deliberately under-expose the remaining silver halide positive image, so as to permit a partial positive image and separately flashing each of the scenes with the additional amount of light such that the partial positive image of each of the scenes visibly indicates the necessity for the desired intensification, and then submitting the roll to final developing and finishing operations.

These operations are carried out in a series of tanks. One tank is designed to permit the undeveloped negative cine film to receive a vigorous negative developer bath of approximately 12 minutes' duration in order to fully bring out the negative image. This and subsequent baths are preferably at 68° F.

A preferred formula for the bath in tank 10 is

Soda sulphite	500 grains (56.7 grams)
Hydroquinone	43 grains (4.9 grams)
Soda carbonate	400 grains (45.3 grams)
Metol	11 grains (1.3 grams)
Potassium bromide	13 grains (1.5 grams)
Water, to make	20 ounces (1000 cubic centimeters)

Film is then rinsed, and then reversed in

Potassium bichromate	53 grains (6 drams)
Sulphuric acid, concentrate	1½ drams (10 cubic centimeters)
Water, to make	20 ounces (1000 cubic centimeters)

Film is again rinsed and cleaned for 5 minutes in

Soda sulphite	200 grains (23 grams)
Water, to make	20 ounces (1000 cubic centimeters)

The film is again rinsed and then travels under a definite under-exposure light-source at the approximate speed of twenty feet per minute. It is important that this exposure be limited to approximately sixty candle-meter seconds, which will at this point assure a deliberate and definite under-exposure to commercial cinema film. The purpose of this step is to guard against any possibility of subsequently over-exposing any scenes that were badly exposed in the camera.

In the next tank, the film receives a partial positive developer bath of approximately one minute in duration, viz.:

Potassium ferrocyanide	32 grains (3.7 grams)
Metol	2¼ grains (0.25 gram)
Soda sulphite	135 grains (15.6 grams)
Hydroquinone	21 grains (2.4 grams)
Potassium bromide	21 grains (2.4 grams)
Potassium carbonate	185 grains (21.1 grams)
Sodium nitrite	4½ grains (0.5 grams)
Water, to make	20 ounces (1000 cubic centimeters)

The object of this bath is to partially develop the latent partial positive image previously under-exposed in the preceding step.

The film next emerges from this tank and passes over the safelight, the light of which is transmitted through the film to enable the operator to observe the scene as it passes before him. At this point, the operator flashes each scene with an additional amount of light that the visual inspection of the scene indicates as desirable to bring up its intensity.

The film then re-enters the re-developer tank and re-emerges where it passes over another safelight. At this point the operator again observes each of the scenes as it passes before him, and again flashes each scene with a final increment of light as each scene indicates as desirable for its intensification. It should be noted here that there is a possibility that some scenes may now appear to need no further intensification. The steps just described enable the operator to give each scene the intensification it requires, thereby properly compensating not only for the original exposure in the camera, but also for the central point of interest in each scene.

Next the film may pass through another tank, where it is treated with a positive re-developer bath for approximately seven minutes. The formula of the solution in this tank is preferably the same as that previously used.

The film next passes through a fourth rinsing bath.

The film then passes through a fixing bath for approximately five minutes. A formula for this bath is as follows:—

Hypo	4 ounces (200 grams)
Sodium sulphite	90 grains (10 grams)
Glacial acetic acid	1½ drams (10 cubic centimeters)
Chrome alum	175 grains (20 grams)
Water, to make	20 ounces (1000 cubic centimeters)

The process up to this point is carried on in a suitable safelight. From this point the process may be conducted in white light. The film is next thoroughly washed.

RECOVERY OF SILVER FROM OLD HYPO SOLUTIONS:

The price of silver has increased 60 per cent in the last three months, and the amount of silver thrown away in old hypo solutions is more than interesting, "it's serious," and a waste of money.

Here is a simple formula for the recovery of silver from hypo. To throw down the silver from waste hypo baths, liver of sulphur is used. The chemical is dissolved to a strong solution and is added to the hypo baths which have been allowed to accumulate to the bulk of, say 20 to 30 gallons, in a wooden cask. As the solution is added, the hypo is stirred vigorously with a flat piece of wood, as long as a dark precipitate is thrown down. With acid baths there is the foul smell of sulphuretted hydrogen, though this can be largely prevented by adding caustic potash or caustic soda solution along with the liver of sulphur. Even if the caustic is added, the operation should be carried on outdoors. The sludge of silver sulphide is given a day or two to settle thoroughly, the clear liquor is then run off with a siphon tube

and the cask may be refilled with waste hypo, and the operation of throwing down silver repeated. When sufficient sludge has accumulated at the bottom of the cask, it is removed, and spread out to dry, after which it is sent to the refiners.

When silver is pure, it has a specific gravity of 10.5, and is very malleable and ductile; melts at a bright red heat. Silver does not oxidize in the air, but when exposed to an impure atmosphere containing traces of sulphuretted hydrogen, it is slowly tarnished, from formation of sulphide of silver. It dissolves in strong boiling sulphuric acid, but the best solvent for it is nitric acid.

The standard coin of the realm is an alloy of silver and copper, containing 92.5 per cent of silver.

To prepare pure nitrate of silver from it, dissolve in nitric acid by aid of heat, and evaporate until crystals are obtained. Then wash the crystals with a little dilute nitric acid, redissolve them in water, and crystallize by evaporation a second time.

MAKING NEW PHOTOS FROM OLD AND FADED ONES:

First clean the print by rubbing it gently, yet firmly, with a tuft of cotton-wool. It is surprising to find what a lot of fine dust and dirt can be got off an old print in this way. A room with a good large window should be selected, and the print fixed up flat against the wall, so that the window light falls nearly perpendicularly on the print. If a sidelight be used, the negative will probably show a lot of tiny cracks which the eye has not noticed. These crack-marks will show unpleasantly in the print copy.

The camera should be set up so that the lens is opposite the center of the print, and the ground glass truly vertical. To facilitate focussing, tear from a newspaper a strip of bold print half an inch wide and, say, a foot long, and pin this diagonally across the face of the print. It is far easier to see when such type matter is in focus than when a photographic print is in focus. Use the largest stop that will give good bright definition with the focussing strip, but, do not forget to remove this strip *before* making the exposure.

For copying old and faded prints, a slow ordinary landscape plate will give a better result than an ortho. plate with or without a yellow screen. The fact is, that the faded image is there all right enough, but as it has changed color and become a pale yellowish tint, we hardly see its fine details on the somewhat dirty paper background. But the ordinary plate is particularly blind to yellow, so that very often it happens —if the plate has not been over-exposed, and yet not under-exposed either—that our ordinary plate seems to restore the image in a quite remarkable way; in fact, this is much in the same way that the ordinary plate accentuates (yellow) freckles which the eye scarcely notices in the pink flesh surroundings.

It will now be clear that a good deal depends on giving just enough exposure to get good strong density in the plain paper parts of our print; anything beyond this is detrimental, inasmuch as it means a reduced chance of securing the very faint or faded yellow details of the original picture.

HOW TO COPY CRACKED PRINTS:

In order to copy a print which is covered with minute cracks, a good plan is to rub powdered chalk into the cracks before the copy is made. If the copy negative is afterwards enlarged, it is possible to spot out even the most minute cracks, which will appear white in the enlargement. The chalk, if lightly rubbed in, will not injure the print, and can be brushed out when it has served its purpose.

RETOUCHING:

Negatives which have been "retouched" in the professional sense, cannot be enlarged. Retouching is seldom required, however, in amateur work, especially if the negatives are made on a panchromatic emulsion, and are fully exposed. Under-exposure is the cause of the need for nine-tenths of the retouching which the photographer would like to be able to do: and in most cases, his negatives are too dense to be amenable to the process at all. If a negative is to be retouched, it must first be made receptive by applying something which shall give a tooth for the pencil. A special kind of varnish is sold for the purpose, known as retouching medium. (Formula given in these pages). A mere trace of this is applied by the finger to the part of the negative, on the gelatin side, which is to be retouched, and rubbed over until it feels "tacky," when it is put aside to dry. In the meantime some arrangement must be fixed up by which the negative can be supported at

a convenient angle with the light behind it. A large printing frame, with a piece of glass in it, will often serve, and on the glass may be put a piece of card to support the negative on its top edge. A good quality H pencil is the best to use, and this should be most carefully sharpened to a very long fine point. The tip should be an inch or more from the commencement of the paper. Fine emery paper is useful to give the last touch to the lead point. When the medium has become sufficiently dry, we may place the negative on its support, and then proceed to work upon it.

The precise nature of the pencil-stroke in retouching must be left to the taste of the worker. The easiest plan I have always found is to make short, fine lines side by side. In fact, it resolves itself into delicate, but not "niggly" shading. There should be no attempt to get a lot of lead on in any one place by using a soft pencil or exerting any pressure, as this will result either in removing the medium or in breaking the point. Stippling a series of dots will often serve; while some photographers work with a fine circular movement of the pencil, taking it off as little as possible, making a continual series of minute rings, keeping the pencil on the negative and always on the move, running lightly from one little defect to another, filling in thin places, blending all the harsh lights and darks, until the effect desired has been obtained. It is a good plan to start retouching by taking a negative of, say, some foliage which is a little inclined to appear spotty, and endeavouring, by the use of the pencil, to make the more transparent parts of the negative print lighter, so that the spottiness is less pronounced. Not only is it excellent practice, but such an application of retouching is more likely to be useful to the amateur photographer than is its employment in portraiture, which calls for other skill and knowledge than the mere ability to darken a light patch to the depth of its surroundings. If the medium does not seem able to take all the pencil we would like to put on, it is not a sign that it has been improperly applied, but that we are trying to add to much. The merest trace of lead is sufficient, if the negative is not over-dense.

The amateur retoucher had better begin by using an exteremely hard lead pencil, such as HHH or HHHH being perhaps the most suitable, and the point should be sharpened in the following manner:—The pencil point should always be kept very sharp by rubbing on fine emery paper. Now touch the abraded surface over the pinhole in a circular manner till the hole is no longer visible. It is as well after several pinholes have been retouched to take a print from the same to see whether they show or not.

Instead of the cuttle-fish advised above, any of the following retouching varnishes may be used. They can be applied with the finger-tip or a wad of cotton-wool direct to the film side of the negative without any other preparation. Do not use too much—a little goes a very long way; just a smear is sufficient.

1

Amber resin	10 grains
Benzole	1 ounce

Dissolve, and allow to subside for twenty-four hours before use.

2

Gum dammar	10 grains
Canada balsam	5 grains
Turpentine	1 ounce

3

Sandarac	6 grains
Shellac	36 grains
Mastic	36 grains
Ether	12 drams

Dissolve, and add

Benzole	2 drams

In retouching portraits, it is not how much one may do to a negative, but how little; not crowding the lead on, but placing it just where the least work will give the most effect.

There is no particular kind of stroke to learn that will enable one to become a retoucher, but just where there is a line, freckle or mark, or whatever the defect may be, carefully fill that part so that it comes even with the surrounding part, and that kept up gradually will be found to result in a nice "grain" in retouching talk, or stipple, as others call it. During the progress of the work occasionally look at the negative reversed, sitting well back, taking a general survey of it, and where the work looks patchy, blend the patches into each other.

Should the work not be satisfactory, it can easily be taken off by rubbing over with the rag and a little turpentine, and fresh medium applied; and in case a negative requires a great deal of work, say a big head (freckled), when no more can be got on the film, varnish the negative, and when quite cold apply the medium as before and continue the work.

COPYRIGHT RIGHTS

The subject of copyright is one that intimately concerns the photographer or producer of any kind of picture in any medium. The present law of copyright is governed by the Copyright Act, 1911, which takes the place of the Act of 1862. The following notes summarise the principal points of interest to the photographic worker.

The law relating to portraiture is as old as photography itself. Under the old Act of 1862, it was necessary for a photographer to register his copyright and pay a registration fee. This is not now required; the mere taking of the photograph automatically confers copyright in the taker of the negative, or, to give him his correct title, "the author." This rule, like most others, is subject to exceptions, of which the case of portraiture comes first. If a visit is made to the studio of a professional photographer for the purpose of having a portrait taken, on the usual terms of payment for a number of copies, the copyright belongs to the sitter and not to the taker; but, notwithstanding this, the sitter cannot demand from the photographer the negative from which the prints were made, as the implied contract is simply for a number of prints, and the negative remains the property of the photographer. His rights in it are not of much value to him because he can be restrained from selling the prints to illustrated papers, or dealing with the negative in any way except for the use of his customer.

Now this only applies to cases where the sitter pays the photographer. If there is no payment, no matter whether the photographer is an amateur or a professional, both the copyright in the photograph and the property in the negative belong to him and he can do as he pleases providing it is not to the disadvantage of the sitter.

The other important exception to the rule that the copyright belongs to the author is in the case of a press photographer who is merely employed by some newspaper or publisher. In this case, the copyright belongs to the employer.

In regard to subjects other than portraits: if a photograph is taken—perhaps from an original point of view—of some well known object, the author cannot claim exclusive right to his originality. Others may go to this identical spot and make as many exposures as they wish. It is not ethical to do this in business, but it is not illegal. What is illegal is to copy an actual print, but the law does not prevent any number of persons photographing the same object.

Copyright is granted in practically all civilized countries although Holland has not copyright laws, at the present time. Certain countries of the world have formed themselves into an International Copyright Union, so that the creation of copyright in one of these countries gives copyright protection to the rest of the countries of the Union. These countries forming the Union agreed to this at a convention at Berlin in 1908. The following countries are in this Union: Great Britain, France, Germany, Belgium, Italy, Denmark, Spain, Sweden, Switzerland, Norway, Portugal, Japan, Luxembourg, Hayti, Liberia, Monaco, and Tunis. Important countries not in this Union are the United States, Austria, and Russia, but it is possible for non-American owners of copyright to have protection in the United States by separate registration. This also applies to a certain extent to other countries not in the Union.

HOW TO MAKE ENLARGEMENTS ON CANVAS:

Now that there are many kinds of sensitizers in bottled form on the open market (obtainable from all Eastman or photo-supply stores, or from a suitable formula given in this book), the artist will find many short cuts which save many days of work, beside the fact of true prospective and correct facial reproduction.

Many commercial artists today are producing absolute true lifelike oil paintings, by using this method. A small negative from any every-day camera is all that is needed, if one has an enlarger. Any grade of artist's prepared canvas can be used regardless of the size of the canvas. The canvas is stretched and tacked to the frame in the usual way, and the bottled sensitizer is applied with cotton-wool or a brush (that is free from metal mounting). Once the sensitizer is applied, the canvas is placed in a dark box to dry, and when dry, it is exposed in the same manner as any enlarging paper, except that double time is allowed for exposure.

When the exposure is over, remove the canvas from the frame and develop in a wash for paper, as described elsewhere in this book (see Development). After washing in running water for fifteen minutes, the canvas is allowed to set

semi-dry and then tacked back on to the frame.

You now have an exact reproduction of the subject with all its half-tones and shadows. Now it is only a matter of "filling in" with oils and the resulting picture is true to life.

The same process can be applied to oil-paintings for silk, satins, suede, velvets, etc., or on to polished wood, ivory, leather, etc.

PHOTOGRAPHY IN NATURAL COLORS

Natural color photography is something that is now passing into a reality, and high prices are paid for photos in natural colors.

In making color photos one must understand that a negative in natural colors must be obtained first and there are several ways of doing this.

A natural color "one shot" camera can be purchased or if the camera fan is handy with tools he can build himself one. Another manner which, is the more popular, is to buy a roll of natural color films (either the Dufray or Eastman's Kodacolor). These films are loaded into any ordinary camera and the picture taken in the usual manner, only an additional 25 per cent has to be added to all the normal exposures, unless you trade in your present lens for a faster one. This is because color films are not as quick as the ordinary orthochromatic.

These films are developed in a reversable developer (see elsewhere in this book) and then fixed and allowed to dry in the usual manner. The next step is to get the natural color film image on paper so as it can be viewed by reflected light (like an ordinary photo). The film is placed in an ordinary printing frame and three prints taken from it onto panchromatic film. But each film has to be filtered so that each film will contain the color it requires and the colors not required will be "stopped" by the action of the filter used.

These filters are sold by all photo and kodak stores. You need red, blue and green. Make sure you buy filters the same size as your films. The green filter is used to make red film, the blue filter for the red film and the red filter is used for the yellow film. If four color natural plates are needed, you make four films using the yellow filter for the black plate.

These red, blue and green films are printed on stripping film and toned in the colors called for, and when these very thin stripping films are laid on paper, one on top of another, a natural color photograph is the result.

After you have printed the three films through their respective filters (giving them the exposure you will find marked on the film box called "film factors"), these films are developed in the usual manner and allowed to dry. While they are drying it is advisable to prepare the paper that you will need later on. Take a piece of ordinary azo photographic paper and place it in hypo (without exposure or development). After fixing wash well and allow to dry.

When the separated color films are dry, contact each of these films on a good grade of stripping paper (The Defender Company manufactures a fine grade of stripping paper which can be purchased from any Kodak store). Contact these strip films in the same way as you do ordinary paper, develop (M.Q.) fix and wash. When these films are well washed, they are toned in the red, blue and yellow toners. Being careful to tone the red film that you used the green filter on, and continue as previously outlined.

When the three stripping films are toned, they are squeeged on the piece of azo paper, first the yellow, then the blue, and finally the red. That only makes three colors. But where the photograph runs from high lights into deep shadows, the reds may cross the blues and the result will be many delightful shades of lavender or deep violets, either finishing in deep reds or dense blue.

The fourth plate, black, is never used except when making natural color photographs for the metal engravers. This black "plate" is then used for outlining.

There is another way of making natural color plates with colored films. Ordinary panchromatic films may be used in a studio, and the filters are placed over the camera lens and three films can be shot in this manner one after the other. However, one has to be careful to see that the camera is well fastened to the floor and that nothing is moved while the three plates are being made. As little as a 64th of an inch would ruin, for when you placed your toned pictures over each other they would not register.

When the three-toned strip films are squeeged on top of each other, the three primary colors you used in toning the strip films will, in turn, give about seven or eight different colors.

These strip films are very durable and you will find very little trouble in handling them. You will find a ready market for the sale of these natural color photos among the photo buyers mentioned in this edition.

Color photography is made possible because a very fair approximation of all colors may be obtained by the mixture of just three. It is possible to make a separate photographic record of any one of these three colors with a color-sensitive (panchromatic) plate by placing a color filter in front of the lens during the exposure. The filter permits certain colors to pass through, while the others are blocked, or prevented from reaching the plate.

Thus, by using three filters tinted in the three so-called "taking" colors, green, bluish-purple, and orange-red, a separate negative record of each of these may be made on three photographic plates. When these are printed separately in the three complementary printing colors, bluish-red, yellow, and greenish-blue, and combined together, they give back the original colors of the subject. Thus, mixtures of greenish-blue and yellow give all of the greens, greenish-blue and bluish-red, all of the violets and purples, and bluish-red and yellow, all of the reds and oranges. All three in combination in different proportions render the browns, the olives and those colors that we refer to as "greys." The negatives will of course in themselves have no color, but each will be a record of the amount of that particular one of the three colors present in the subject.

It is sometimes difficult for the beginner to understand why color separation negatives are not printed each in the same color as the filter through which it was exposed, and why, in fact, they must be printed in exactly opposite colors.

First, let it be clearly understood that the finished color print is built up, so to speak, of three positive images superimposed, one on top of the other. Each of these images is in a different color and each is a reproduction of the amount of that color which showed in the original subject. Now let us remember that the light which hits the filter in front of the lens is divided into two parts, one part being absorbed by the filter and the other passing through the lens to the plate. Let us call for the moment these two parts "absorbed color" and "transmitted color." It is "transmitted color" which reaches the plate and causes the negative image, afterwards developed. It is obvious that a positive print made from this negative would reproduce the subject in light and shade exactly according to the amount of "absorbed color" in the subject. This then, is the color in which the negative must be printed. Therefore, the negative must be printed in the color complementary to the filter.

HOW TO TURN YOUR PRINTS INTO REAL MONEY

Photography is one of the most fascinating pastimes one can indulge in, but sometimes it is a little more expensive than one's pocket-book can afford. For the benefit of our readers, we have included a list of companies that will buy your prints, if the subjects are interesting. The author knows many amateurs earning their livelihood by this means.

NAMES OF FIRMS WHO ARE CONSTANT BUYERS OF PHOTOS

American Agriculturist 500 Fifth Avenue New York City	Buys prints of live stock, farm homes, and agricultural subjects. Size, 5x7; 6x8. Price paid, 50 cents to $2 per print.
American Boy, The Detroit, Mich.	Prints of any subjects interesting to boys. Size immaterial. $1 to $3 per print.
American Exporter New York City	Harbors, shipping interests, wharves, vessels, packing and shipping methods, systematic business methods.
American Golfer New York City	Prints of golfing subjects. Size immaterial. Payment varies.
American Press Association New York City	News and feature photographs.
Apparel Gazette 311 East 4th Street Los Angeles, Cal.	News items and photos of interest to the trade.
Architectural Record 119 West 40th Street New York City	Prints of architectural subjects—exteriors, interiors, bits of detail, etc. Size 8x10. $1.50 to $3.
Automobile Topics 1790 Broadway New York City	Garage methods and plans of equipment of interest to dealers.
Baltimore and Ohio Employers' Magazine Baltimore, Md.	Photographs pertaining to railroading, tracks, engineering work, repairs.
Blanchard, Harry F. 65 Hudson Street South Glens Falls, N. Y.	Negatives. Pictures to be used for magazine covers. Farm subjects. 4x5, larger size preferred; glossy paper. Pay according to value of photograph.
Boy's World, The Elgin, Ill.	Wants pictures of subjects for general interest to boys between 10 and 16 years of age; pictures of children in action.
Brown & Bigelow St. Paul, Minn.	Photographic subjects for art calendars, celluloid novelties, and cloth and leather specialties.
Campbell Art Co. Elizabeth, N. J.	Prints of new and pleasing subjects for art reproductions and pictorial advertising.
Collier's 250 Park Avenue New York City	Prints, unmounted Velox. Current events. 3¼x5½, or smaller if clear and sharp. $3 to $5.
Country Life in America Doubleday, Page & Co. Garden City, L. I., N. Y.	Prints must be on glossy papers, not too contrasty. Pertaining to country life. 6½x8½. $1 to $10.
Drysdale Co., The 209 S. State Street Chicago, Ill.	Publishers of Things Artistic. Photographs and original designs.
Eastman Kodak Co. Rochester, N. Y.	Annual advertising competition $3000 cash prizes for photographs for advertising purposes. See photographic papers for announcements.
Farm Journal Washington Square Philadelphia, Pa.	Farm and household pictures.

The Farmer
Webb Publishing Co.
55 East 10th Street
St. Paul, Minn.

Prints: farm scenes, illustrating conditions in Northwest. Any size 50 cents to $1. Familiar scenes to northwestern farmers, 8x10. $2 and up.

Folmer & Schwing Division
Eastman Kodak Co.
Rochester, N. Y.

Negatives made with Graflex cameras only. Send proofs from negatives. Suitable for publicity work. Proofs returned with letter accepting or declining negative.

Field & Stream
578 Madison Avenue
New York City

Shooting, fishing and general outdoor subjects. Any size. Cover size must be multiple of 5x7. Payment varies.

Green Book Magazine
North American Building
Chicago, Ill.

Unusual photographs of people and incidents in non-professional sports.

Grit Publishing Co.
Williamsport, Pa.

News photographs. Prints of human figure in central point of interest; one or two figures. 5x7 or 6x8. 50 cents and up on copyrighted photographs.

Hannah, Henry King
227 Broadway
New York City

Write regarding pictures he wants.

Herald Syndicate
New York City

News Photographs.

House Beautiful, The
8 Arlington Street
Boston, Mass.

Prints of attractive small houses and gardens. Any size; cannot use any on a smaller base line than 4 inches. $1 to $5.

Ladies Home Journal
(Art Department)
Philadelphia, Pa.

Always willing to consider photographs submitted to the editors for approval, and, if available for use in the Ladies Home Journal, will purchase at prices which vary according to the subject, the reputation of the photographer, etc.

LIFE MAGAZINE
(Art Department)
Rockefeller Center
New York City

Prints of news value. Any size unmounted.

Majestic Publishing Co.
316 Newton-Claypool Building
Indianapolis, Ind.

Original designs and texts for postcards.

Metropolitan Magazine
22 West 48th Street
New York City

Except dramatic subjects, uses only photographs made to order. Size immaterial. Average price, $8 per print.

Modern Priscilla
Boston, Mass.

Buys prints only reproducing original patterns in different kinds of fancy needlework, and photographs illustrating household articles. Size immaterial. Payment varies.

Motor
572 Madison Avenue
New York City

News items, automobile industry.

Motor Boat
63 Beekman Street
New York City

Motor-boats in action, scenes in which motor-boats are prominent features. 4x5 to 8x10 $1 per print.

Musician, The
Oliver Ditson Co., Publisher
113 West 57th Street
New York City

Character in musical work; pictures that tell a story.

National Sportsman Magazine
Boston, Mass.

Outing Photographs. 3¼x4¼. 50 cents per print.

Oakley, P. Benson
Box 102
Norwich, N. Y.

Photographs of unsual events, aviation, great disasters, fires, floods, etc.

Outlook
New York City

Buys news, scientific photographs, etc. and portraits. 5x7. Price varies.

Popular Mechanics Magazine
200 E. Ontario Street
Chicago, Ill.

Photographs of new, curious and interesting things; almost everything except portraits. Any size; clear, sharp prints, preferably glossy. Description on the back of the print.

Power Wagon
Chicago, Ill.

Motor trips, new and unusual uses of automobiles and trucks.

St. Nicholas Magazine
New York City

Juvenile subjects and illustrations of special descriptive scientific or nature articles. 8x10. Price paid varies.

Strout, E. A.
255 Fourth Avenue
New York City

Farm scenes, harvesting, children at play, boating, fishing and outdoor subjects, for advertising purposes. Send description of what you have to offer.

REFERENCE DICTIONARY OF PHOTOGRAPHIC CHEMICALS AND THEIR USES

Acetic Acid.—A volatile liquid, having a strong odor of vinegar. When concentrated (glacial) is corrosive. It is a solvent for gelatin, celluloid, and pyroxyline, and when used as a constituent of photographic baths, must therefore be present only in a very small proportion. Usually as a 28 per cent solution. This is made from glacial acid by mixing three parts of acid with eight parts of water. Used to acidify fixing and toning baths. Keep in a glass stoppered bottle.

Acetone.—A colorless inflammable liquid, has an odor of ether. It is soluble in all proportions in water, alcohol, and ether. It is an excellent solvent for fats, resins, and celluloid. Used in conjunction with amyl acetate to make negative varnishes. A solution of collodion in acetone used as a varnish gives a matte surface.

Albumen.—The dried white of eggs. An exceedingly complex organic compound of carbon and hydrogen, oxygen, nitrogen, and sulphur. Swells in cold water and dissolves to form a thick solution. It is used in the preparation of albumenized paper as a substratum in process work and for sensitizing zinc plates in photo etching.

Alums, Potassium, Potassium Chrome, and Ammonium.—All soluble in cold and hot water. Used in fixing baths as a hardener and clearer to prevent stains. Chrome alum is the most efficient. Also used in some toners.

Amidol.—One of a group of isomeric compounds, five of which are developers. Supplied as a powder, varying in color from white to dark grey. Keeps well in powder form if kept dry, but in solution deteriorates rapidly. Never mix more than is to be used at once as it quickly turns to a dark brown liquid which stains the hands and prints. Gives nice black tones when used as a developer. Used in tropical developers.

Ammonia.—A water-like liquid of pungent smell. Used in emulsion making, and in pyro developer for making warm toned lantern slides. Used in the fixing bath for platinum printing. Also very good for stripping the emulsion from old plates and films.

Ammonium Bichromate.—Orange red crystals, similar to potassium bichromate. Used in making halftones on zinc and copper as a sensitizer for albumen or fish glue.

Ammonium Bromide.—Coarse white powder or crystals, very soluble. Used as restrainer in developers and as an ingredient in bromide emulsions.

Ammonium Carbonate.—Comes in white lumps that are soluble in water. Used in pyro and other developers for making warmer tones. Should not be dissolved in hot water.

Ammonium Chloride.—This is sal ammoniac, a white crystalline powder, very soluble and somewhat hygroscopic. Used in preparing chloride emulsions, salting printing papers, and with bichloride of mercury for making bleaching baths. Used in fixing and toning baths for chloride papers.

Ammonium Citrate.—Needle crystals, deliquescent, soluble in water and alcohol. Used as a restrainer in pyro developer, and as a developer for chloride emulsion plates. Used also in blue print work. A 10 per cent solution makes a good clearing bath for a pyro stained negative.

Ammonium Iodide.—White crystalline salt. Hygroscopic, very soluble in water and very unstable. Used for speeding up emulsions and making iodized collodion. There is a slight use as a salting solution for papers.

Ammonium Nitrate.—Transparent white crystals, very soluble in water. Used in the old time magnesium flash powders, as it gives less smoke. Retards the action of pyro in developers. Used in the gum etch in the bromoil lithography process.

Ammonium Oxalate.—Colorless crystals, soluble in water, used to replace potassium oxalate in ferrous oxalate developer. Sometimes used in preparing platinum papers.

Ammonium Persulphate.—White crystalline powder, soluble in water, uncertain in its action if impure. Used as a flattening reducer to give less contrast for negatives, as it reduces the denser portions without effecting the shadow details.

Ammonium Phosphate.—Soluble in water. Used for fireproofing fabrics and wood. Used also in emulsion making and toning.

Ammonium Sulphide.—Colorless liquid. Has the odor characteristic of rotten eggs. Used in the sulphide process of toning and for mercurial intensification.

Ammonium Sulphocyanide.—Colorless, clear crystals, very soluble in water, so deliquescent that they must be kept in an airtight bottle. Used in gold toning and in developing over-exposed prints.

Amyl Acetate.—Colorless oily liquid smells like bananas, hence nickname "banana oil." Solvent for celluloid and pyroxyline. Used in cold varnishes and as medium for mixing bronze powders.

Asphaltum.—A black, gassy substance with a tarry odor, soluble in benzole and turpentine. It is light sensitive and is used in photo-mechanical processes and as a resist in etching zinc and copper plates.

Barium Bromide.—Comes also as barium chloride and barium iodide, all soluble in water and all very poisonous. These barium salts are all used in emulsion, especially the bromide which gives greater contrast.

Barium Sulphate.—Called "Mountain Snow." Poisonous. Used in making imitation opal glass and for coating photographic papers before sensitizing.

Benzene.—Must not be confused with benzole, or gasoline. Used as solvent for waxes, resins, rubber, etc., and for cleaning purposes. Inflammable.

Benzoic Acid.—White crystalline needles. Used as a preserver in emulsions and in toning baths.

Bleaching Powder.—Commercial term for chloride of lime, a mixture of calcium hypochloride and other calcium compounds. Used to extract hypo from prints, and as a good clearing agent for stained negatives and prints. Very soluble in water.

Borax.—Sodium borate. Used in gold toning baths, and as a mild alkali in fine grain developers, and in developers for platinum papers. Acts as a restrainer with some developers.

Cadmium Bromide.—White crystals, soluble in water, a double cadmium and ammonium salt. Used in collodion emulsions.

Calcium Chloride.—Used as a desiccator in storing sensitive materials in tropical climates, and also in the sulphide process of sepia toning.

Caramel.—Golden brown, gummy substance obtained by heating sugar over a fire. Used as a non-halation backing for plates.

Carbolic Acid.—Colorless needle crystals. Soluble in water. Volatily poisonous and will burn skin. Used as powerful preservative in emulsions, mounting pastes, and gelatine solutions.

Canada Balsam.—Clear yellow or greenish yellow syrup fluid. Insoluble in water but soluble in alcohol. Used for cementing glass, for preparing varnishes, and for making photoprints transparent for use as negatives.

Caustic Potash, Potassium Hydroxide.—White sticks, soapy to the touch, soluble in water, powerful alkali that neutralizes acids. Used as an accelerator in developers, and for getting warm tone lantern slides and plates. Must be used weak or it will frill the emulsions. Used with warm or hot water for stripping negatives or old plates.

Caustic Soda, Sodium Hydroxide.—Comes in white stick like the potash and is similar in action and has about the same strength in solution.

Cellulose.—A material from which paper, pyroxyline, celluloid, and the flexible transparent films are made. All motion picture films and professional films are made from cellulose. It is a natural constituent of all fibers and woody plant stems.

French Chalk.—A very fine white or greyish powder used for polishing glass surfaces, upon which photographic prints are to be squeegeed for glazing.

Citric Acid.—Clear crystals or powder, unstable in solution with water, decomposing in contact with air into acetic and carbonic acid. Used as the acid constituent of clearing or acid fixing baths, and as a preservative for developers and emulsions. Can be substituted for acetic acid in some formulas.

Chloroform (Trichloromethane).—A colorless heavy mobile liquid, only slighty soluble in water, entirely soluble in alcohol. Dissolves fats and resins, and is used for making encaustic pastes for photoprints.

Chrome Alum.—See Alums.

Copper Chloride.—Green-blue crystals, poisonous. Used in negative reduction, and also in emulsions for contrast. Also used in toners and carbon sensitizers.

Copper Sulphate (Blue Vitriol).—Comes in large blue crystals or greenish white powder. Poisonous. Used for toning and bleaching, and for intensification in process printing.

Sensitizing Dyes.—These dyes are used to increase the emulsion's sensitivity to different colors of light. The use of these dyes determines the amount of orthochromatism or panchromatism of the emulsion. The commonest are: Eosin, erythrosine, cyanin, diocyanin, ethyl red, rose bengal rhodamine, pincyanol, and pinachrome.

Ferric Ammonium Citrate.—A light sensitive salt. Comes in brown pearl crystals or in the form of green scales. The latter is more sensitive to light and is preferable for photographic use. Deliquescent.

Ferric Chloride. (Iron Perchloride).—Yellow red opaque mass or lumps. Deliquescent. Used to reduce overexposed negatives, in blue and green toning baths, and for etching copper plates in photo-engraving.

Ferric Oxalate (Iron Sesquioxalate).—Comes either in dark greenish scales or in brown crystals. Extremely light sensitive. The manufacture of this chemical is difficult and it has been practically withdrawn from the chemical catalogues. It is very unstable, and will not keep under any conditions. Was used in old time methods of photography but has been displaced by silver bromide and chloride. It is soluble in water.

Ferric Sulphate.—Emerald green crystals. Soluble in water. Used as a reducer.

Ferrous Ammonium Sulphate.—Clear green crystals. More stable than ferrous sulphate and has displaced it in many uses. Used in ferrous oxalate developer.

Formalin.—(40 per cent solution of Formaldehyde). Poison. Bad for throat and eyes. Has a very strong tanning action on gelatin and is much used in hardeners, especially for tropical developers.

Gallic Acid.—Yellowish brown crystals. Used as a developer with tannic acid in ferro-gallic process to obtain strong blacks and also in photo-lithographic processes.

Gelatine.—A complex colloid compound. Comes in sheets, threads, or in granular form. Forms the backbone of all photographic emulsions as it is used to carry the silver salts in suspension. Without gelatine, photography would be retarded almost a century to approximately 1840.

Glycin.—Glistening white powder. Slightly soluble in water. Used with sodium sulphite solutions, is non-staining and is used in tank developers.

Glycerine.—Heavy odorless clear liquid. Used as a preserver in pyro developers and as a restrainer in ferrous oxalate developer. Keeps films from becoming dry and brittle. Prevents too rapid drying and is used in formalin hardening baths to prevent cracking the films.

Gold Chloride.—Made by dissolving metallic gold in nitric acid and evaporating the acid. Soluble in water. Used in gold toning of prints giving many various and beautiful tones ranging from purple through red to intense black. Comes in 15 grain sealed tubes. The entire 15 grains should be dissolved at once and made into a stock solution. Keep away from strong light.

Hydrazin.—This is sometimes added to bromide emulsions to give wide latitude in exposing without danger of reversal of image.

Hydrochloric Acid (Muriatic Acid).—Colorless fuming liquid that is very poisonous and corrosive. Consist of 37 per cent hydrochloric acid dissolved in water. Used to add to emulsions for gathering speed and in toning baths to acidity.

Hydroflouric Acid.—A fuming liquid, extremely corrosive and very dangerous to handle. Combines noisily with water and should be stored in lead, rubber, or waxed vessels. Dissolves all silicates. Used for dissolving glass in some stripping processes and in etching glass to matte the surface.

Hydroquinone.—Common name of a widely used developing agent, should be used at a temperature not lower than 65° F. as its action as a developing agent ceases at 40° F. Gives extreme contrast.

Hypo (Sodium Thiosulphate).—This salt is actually sodium thiosulphate though popularly called sodium hyposulphite. Comes in large clear crystals, known as pea crystals, and also as a granulated white powder. Its essential use, as a fixing agent, depends upon its solvent action on unreduced silver halides, 100 parts of a 20 per cent solution being able to dissolve nearly 6 parts of silver bromide. This solution has a slight power of attacking metallic silver and for this reason prolonged immersion of negatives or prints may lead to a slight reduction.

Iodide (Potassium Iodide).—Used in wet collodion process and in process work cutting lines on half tone negatives, and used in emulsions to give additional speed. Must be dissolved in water before iodine will dissolve. Used also with bichloride of mercury to tone pictures orange color.

Iodine.—Blue gray scales, volatile, poisonous. Very hard to dissolve in plain water but dissolves easily in a solution of iodide. Used as a bleach and reducer and to remove silver stains from the hands. See Stains on the Hands.

Lead Acetate.—Coarse white crystals soluble in water and very poisonous. Used in combined toning and fixing baths, for certain kinds of papers.

Lead Nitrate.—Small white crystals, soluble in water. Used for its power to give great contrast in process line work.

Manganese Dioxide.—Heavy black powder. Used in flashlight powder and as a raw material from which to prepare oxygen.

Magnesium Sulphate (Epsom Salts).—Small colorless prismatic crystals, soluble in water. Used in developers as a hardener.

Mercuric Chloride (Bichloride).—Extremely poisonous, soluble in water. Used as a bleach and as an intensifier.

Mercury (Quicksilver).—Silvery metal, liquid at all ordinary temperatures. Forms mercuric chloride with hydrochloric acid. Has little use save as an indicator in thermometers.

Metol.—A trade name for an ordinary developing agent. Also known or sold under the name of: Pictol, Elon, Rodol, Satrapol, etc. Comes in fine white needle crystals, soluble in water. Nearly always used in conjunction with hydroquinone as a developer.

Nitric Acid.—A heavy, yellow, or colorless liquid, mixes in water, very corrosive, extremely poisonous, used as a preservative for hypo in silver baths for wet collodion, and for etching zinc plates in the photomechanical processes.

Oxalic Acid.—Colorless and odorless crystals soluble in water, extremely poisonous. Used as a preservative in pyro solutions, and in platinum process. Very efficient stain remover, but is not used much because of the necessity of a thorough washing to remove the acid. Precipitates metallic gold from solutions containing gold salts.

Paramidophenol.—The base from which several developing agents are made. Chief among these being metol (elon, pictol, rhodol, satrapol).

Phosphoric Acid.—A colorless thin syrupy liquid. Mixes freely with water, used for platinum solutions and also gold solutions to acidify. Used also in making zinc line and half-tone cuts.

Pinacryptol.—Green, or yellow dye compounds that have the power to render a silver emulsion comparatively insensible to light without destroying the latent image. Used as a desenitizer for films enabling them to be developed in an orange light. More efficient than phenosafranine, odorless, and does not stain.

Potassium Cyanide.—White amorphous cakes, very deliquescent, extremely poisonous, and dangerous to handle. Soluble in water, slightly so in alcohol. Used in the last century as a fixer, but now hypo has displaced it for this purpose and is not so dangerous to the user.

Potassium Ferricyanide (Red prussiate).—Bright red crystals, soluble in water, Poisonous. Widely used in bleachers, especially for the sulphide process of sepiaing, and also in blue prints, and blue toning baths.

Potassium Ferrocyanide (Yellow Prussiate).—Yellow crystals, soluble in water, very poisonous. Must not be confused with the ferricyanide. Used in some toning baths.

Potassium Ferrous Oxalate.—The active developing agent in iron development.

Potassium Iodide.—Small colorless crystals, VS. in water; SS. alcohol and ether. Uses: emulsion making, reducing fog and increasing contrast; in mercuric-iodide intensifiers; wet collodion process, and to prevent abrasion marks in gaslight paper development.

Potassium Metabisulphite.—Transparent needle crystals or crystalline powder, soluble in cold water. An acid salt used in preparing acid fixing baths, and as a preservative in place of sodium sulphite with developers especially pyro and hydroquinone.

Potassium Nitrate.—Prismatic transparent crystals. VS. in water. Uses: in platinum printing; the preparation of pyroxyline and as an energetic oxidizer in flash powders.

Potassium Oxalate.—Used in ferrous oxalate developer and platinotype process. Poison.

Potassium Permanganate.—Purple black needle crystals of metallic lustre. Soluble in water, sulphuric and acetic acids, alcohol. Powerful oxidizing agent. Uses: as negative intensifier (neutral solution); reducer (acid solution); stain remover and bleacher in redevelopment and reversal processes; hypo eliminator and test for hypo.

Quinolin Yellow.—An acid dye known as cine yellow, said to remove the pink stain resulting from mordanting with rhodamin B in making color transparencies.

Resins.—Light-sensitive. A condensation product of furfurol, acetone and concentrated sodium hydroxide, diluted with benzole, gives a solution or synthetic resin which is insolubilized by light action, which is employed in photomechanical processes.

Resorcin.—White prismatic crystals, VS. in water. Used in emulsion making.

Rodinal.—Trade name of a concentrated solution of para-amidophenol chlorohydrate giving, when diluted with water, a serviceable developer for plates, films and papers. Unal (powder form), citol, paranol, and activol are similar preparations.

Salicylic Acid.—White needle-like crystals or powder; slightly soluble in cold water; VS. in hot water, alcohol. Use: preservative in emulsions and mountants.

Silver.—A white, comparatively soft metal; forms a large variety of light-sensitive salts employed as the bases of the sensitive material used in photography.

Silver Ammonia-nitrate.—Colorless needles. Very soluble in water and alcohol. Use: in emulsions and sensitizing plain papers.

Silver Bromide.—A light-yellowish powder, insoluble in water, alcohol, soluble in excess of potassium bromide, cyanide, alkaline "hyposulphites." Alone or with iodide and chloride it forms the sensitive salt in modern emulsions.

Silver Carbonate.—A yellowish granular powder; insoluble in water, alcohol; soluble in potassium cyanide, ammonia and sodium hyposulphite. Used in emulsion making.

Silver Chloride.—Insoluble in water, alcohol; soluble in ammonia, "hyposulphites." The principal light-sensitive salt used in p.o.p. and d.o.p. emulsions.

Silver Chromate.—A red, amorphous powder soluble in ammonia and sodium "hyposulphite." Used in p.o.p. emulsions to add contrast.

Silver Citrate.—White powder, soluble in ammonia, potassium cyanide and sodium "hyposulphite." Use: in citrate p.o.p. and chloride d.o.p. emulsions.

Silver Cyanide.—A white flocculent powder formed by the addition of potassium cyanide to silver nitrate. Very poisonous. Used: in Monckhoven's intensifier.

Silver Iodide.—A white or yellowish crystalline powder. Insoluble in water, alcohol, soluble in potassium cyanide, iodide, chloride, and hypo. Uses: in wet collodion process and preparing gelatin emulsions.

Silver Nitrate.—Poison. Colorless, flat crystals, very soluble in water. The most important of silver salts used in photography; emulsion making; intensification, etc. In process work for etching steel—with nitric acid.

Silver Phosphate.—Heavy yellow powder, soluble in ammonia, organic acids and hypo. Used in print-out and chloride d.o.p. emulsions to secure a long scale of gradation.

Silver Sulphide.—A brownish-black compound, insoluble in water, alcohol and ammonia, but soluble with decomposition in nitric acid. It is supposed to form the brown or sepia image of sulphide-toned bromide prints, and its presence in the silver halide grain is said to be the predominant cause of speed in gelation-bromide emulsions.

Silver Tartrate.—A fine, white powder, very soluble in water, soluble in ammonia and nitric acid. Use: in making printout emulsions.

Sodium Biscarbonate.—Fine, white powder, very soluble in water. Used: in gold toning baths.

Sodium Bichromate.—Red, crystalline fragments; deliquescent very soluble in water. Use: replaces potassium and ammonium salts in carbon printing, etc.

Sodium Borate.—(See Borax).

Sodium Carbonate.—Three forms of sodium carbonate are sold for photographic use, comes in clear, glassy crystals or coarse white powder. Very soluble in water, glycerine. The principal alkali or accelerator used in development.

Sodium Hyphosulphite.—(See Hypo).

Sodium Nitrite.—Not to be confused with sodium nitrate. White opaque sticks or colorless crystals. Very soluble in water, slightly soluble in alcohol. Use: in preparing photometer test papers and the diazotype process.

Sodium Oxalate.—White crystalline powder. Poisonous. Slightly soluble in water. Use: in platinotype process.

Sodium Silicate.—Synthetic soda water glass. White or bluish gray lumps, or a syrupy yellow liquid. Use: in colotypy, as a substratum.

Sodium Sulphite.—Transparent white crystals or powder; efflorescent, keep in well stoppered bottles, very soluble in water, slightly soluble in alcohol. Use: preservative in developing solutions; active energizer in amidol development; in fixing baths; blackener in negative intensification.

Sodium Tratrate.—White crystals, soluble in water. Use: in p.o.p. emulsions.

Starch.—White amorphous powder which by boiling with water gives a semi-transparent paste. Use: sizing photographic papers and in mountants.

Strontium Bromide.—Strontium chloride, strontium iodide, soluble in water,

Strontium Bromide.—Strontium chloride, strontium iodide. Soluble in water, alcohol. Use: in collodion and gelatine-chloride emulsions to increase contrast.

Sulphuric Acid.—A heavy, oily colorless liquid. Poison and very corrosive. Miscible in all proportions with water (add the acid in small quantities to the water, never add water to acid). Use: preservative of pyro solutions; in acid fixing baths and bleaching solutions.

Sulphurous Acid.—A 6 per cent aqueous solution of the gas SO, sulphurous anhydride. Suffocating, irritating odor and fumes. Unstable in solution. Use: preservative in developers, pyro, etc. and acidifier of fixing baths.

Tannin.—Not a true acid. Lustrous, yellow amorphous powder; very soluble in water, alcohol. Use: dry collodion process, and in etching solution in collotype process.

Tartaric Acid.—Colorless, transparent crystals, soluble in water, alcohol. Use: as preservative for sensitized paper and in emulsions.

Thiocarbamide.—White prismatic crystals, very soluble in alcohol, soluble in water. Uses: gives color in lantern slides by development; removes dichroic fog and stains in negatives: with eikonogen tends to reversal of negative.

Uranium Chloride.—Poisonous. Deliquescent greenish-yellow plates, soluble in water, alcohol. Use: sensitizer for plain papers, and chloride emulsions to increase contrast.

Vanadium Chloride.—Poisonous. Dark-green, syrupy mass. Soluble in water, alcohol. Use: toning bromide prints green: various dye processes.

Zinc.—The salts of zinc, bromide, chloride and iodide are used in collodion emulsions.

Zinc, Hyposulphite of.—According to a U.S. patent (1927) the addition of a solution of hyposulphite of zinc to old fixing solutions offers a simple method of recovering silver wastes or residues.

Zinc Oxide.—The chief ingredient in white pigments used in retouching photographs for reproduction.

PLASTICS

Plastics may be defined as materials which may be shaped by means of applied pressure into desired shapes and forms. The temperatures at which these materials are thus formed may vary in the different processes and with different compositions and thus we have two general classes of plastics, namely: cold-molded and hot-molded, dependent on whether the die which is used to form the plastic composition is kept at room temperature or whether it goes through a cycle of heating and cooling, or heated to a definite temperature. Some of the plastics have the property of hardening when subjected to heat and pressure and forming infusible bodies which can no longer be melted, these are termed thermosetting, while thermoplastic compositions which are usually formed during a cycle of heating and cooling do not become infusible and may be subsequently fused or reformed on the application of heat. Cold-molded compositions cured by heat on removal from the dies are more heat-resistant. The process of manufacturing plastic compositions are many and varied. Generally plastics are made up of two components, a filler and a binder. The binder has the property of cementing together the filler which consists of the bulk of the composition, lowers the price and in many cases renders the composition harder, tougher, more elastic or stronger. Materials used as binders consist of a large variety of inorganic and organic substances such as cements, bituminous products, resins both natural and synthetic, gums, cellulose esters and ethers, proteinous compounds with or without such substances as oils, waxes, solvents, plasticizers and lubricants to give the desired properties of elasticity, toughness, strength and heat resistance as may be demanded by the particular plastic which is compounded and also to improve the molding process. Among the fillers are such substances as cotton flock, wood flour, asbestos fibre, clay, silica, mica and other mineral fillers together with pigments to give the mass the desired color.

A composition suitable for plastic molding must be so compounded that an intimate and homogeneous mixture of the filler and binder is obtained. To this end various types of machines are used, such as kneading and dough mixing machines, rubber rolls, powder mixers to effect the thorough conglomeration of the binder and filler which is obtained either in the form of a powder or sheets or cake form. These are usually ground in suitable grinders or disintegrators and screened to obtain graded powders or else cut up in small preforms to be fed to the die. In many cases the powder is fed to a preforming press which gives off simple geometrical forms which may after be used to feed in the die to obtain the final article.

Plastics are usually subdivided into classes with reference to the nature of the binder employed:—

Compositions from Proteins.—Proteinous compounds such as blood albumen, gelatin, glue, casein, beer yeast, sea weeds and egg albumen are used quite frequently in the compositions to act as binders for sawdust, asbestos, talc, chalk and vegetable fibres. These compositions in many cases are hardened by immersing in a formaldehyde bath and then drying.

I.—25 parts of sawdust are mixed with 150 parts of chalk and to it added 45 parts of gelatin and 10 parts of glue previously dissolved in water; the material is mixed in water and molded. Colors may be added.

II.—A composition from blood albumen may be made by dissolving 100 parts of dessicated blood albumen in 150-200 parts of water, 5½ parts of ammonium hydroxide specific gravity 0.90 and 15 parts paraform. The blood albumen is covered with water, allowed to stand about 2 hours, the mixture stirred, the ammonium hydroxide added and then the paraform a little at a time keeping stirring continually. The mass will thicken but on continued working it will become fluid again. It can then be mixed with a filler such as sawdust and pressed in a cold die.

III.—A composition from casein may be made by preparing a solution of 10 parts of casein in 90 parts of water, to which has been added 2 parts of lime, to the casein solution is added the desired filler in accordance with the articles being produced, cork, wood flour or marble dust, until a wet powder is obtained. This is pressed at a temperature of 140° F. and the molded object dried.

IV.—A composition for dolls or toys may be made from 20 parts glue, 4 parts paper pulp and 76 parts whiting. The material is mixed, molded cold and dried. The glue is first dissolved in water and then mixed with the fillers to obtain a dry but still plastic powder.

V.—Ernolith is a composition made from beer yeast treated with formaldehyde mixed with a filler and pressed in a hot mold at 180° F.

VI.—A composition for doll's heads is made by dissolving 8 parts of glue and 1 part gum arabic in 12 parts of water at about 200° F. To this is added 12 parts paper pulp and the mass is stirred rapidly. Whiting is then added to give a mass dense enough to be molded. The objects are then allowed to dry in the air and finally at a gentle heat after which the surface may be impregnated with oil, resins, waxes, and lacquered.

Plastic Masses from Bitumens, Oils and Resins.—These products are mainly used in the manufacture of heat-resistant compositions, electrical insulation and battery boxes.

I.—A hard rubber substitute is made by melting 35 parts of Trinidad asphalt with an equal amount of stearine pitch. To this is added 4 parts of powdered sulfur and the material is heated for 2 hours at a temperature of 340° F. to vulcanize.

II.—A composition for electrical insulation is made by dissolving 2 parts of pitch from coal-tar distillation in 1 part of heavy coal-tar naphtha and mixing with equal parts of asbestos fibres to give a plastic powder which is molded under pressure into the desired forms and afterwards hardened by baking for 24 hours at 400° F.

III.—A composition for battery boxes may be made by melting 100 parts of gilsonite with 10 parts of montan wax, sufficient wood flour and cotton flock may be added to give a pasty mass which is pressed while hot in cold dies to give the desired article.

IV.—A composition suitable for cold-molding may be made by mixing 10 parts of linseed oil with 10 parts of petroleum asphalt, 6 parts rosin and 74 parts filler such as fine asbestos fibres. The materials are mixed in a kneading machine to give a powdery conglomerate which is afterwards pressed in a closed die under heavy pressure. The articles are then baked to harden.

V.—A mixture of 6 parts pitch, 3 parts rosin, 1 part castor oil and ½ part clay is used to seal bottles.

VI.—An excellent mass is obtained by melting together 40 parts pitch, 2 parts wax, 18 parts shellac, 10 parts carbon black and 30 parts ochre. The mass is powdered by mixing in a powder mixer. The whole is melted at 250-260° F. and while hot pressed into desired shape in a cold die.

Plastic Masses from Synthetic Resins.— Phenolic-formaldehyde condensation products may be made by reacting 1 molecular weight of phenol with 1 molecular weight of formaldehyde in the presence of a catalyst. Such a resin may be prepared by mixing 50 parts of phenol with 30-60 parts of 40 per cent formaldehyde and adding 2-8 parts of ammonia water 15 per cent strength. The material is gently heated with steam in a jacketed kettle until a solid is obtained which is very friable and still fusible. The resin is then poured off in shallow trays and continued heating in an oven, preferably under vacuum until it no longer fuses but is still elastic when hot. At this stage the resin is pulverized and incorporated in the various ways with wood flour or asbestos and pigments to give a powder which after being worked on the rolls is ground and then ready for molding in a hot die into the required shapes.

Plastics from Inorganic Materials.—I.—Sodium silicate (waterglass) may be used to bind wood flour or other fillers which may then be molded under pressure to obtain hard objects.

II.—A composition suitable for molding into various shapes may be made by mixing 20 parts lime with 40 parts of fine silica and 40 parts of asbestos fibres, setting into a plastic dry powder which may be molded under pressure. The mass is then hardened by subjecting to the action of steam in an autoclave at 125 pounds pressure.

III.—Another formula calls for 50 parts Portland cement, 20 parts asbestos fibres, 10 parts water, 10 parts pigment. The materials are thoroughly mixed, molded and then coated with a solution of gum arabic to give a gloss.

IV.—Artificial stones may be made by mixing Portland cement with asbestos fibres and adding vegetable fibres.

V.—A magnesia cement composition is made by mixing thoroughly 72 parts of freshly calcined magnesite with 22 parts Epsom salt, and 5 parts of lead acetate. The whole is mixed dry and water added to give a plastic powder which may be molded under pressure to give the object desired.

RECENT DEVELOPMENTS IN MISCELLANEOUS POLISHES

AUTOMOBILE WAX PASTE:

A	Carnauba wax	20	pounds
	Beeswax	13	pounds
	Montan wax	7	pounds
	Stearic acid	5½	pounds
B	Turpentine	7	gallons
	Varnolene	7½	gallons
	Triethanolamine	2¾	pounds
	Water	7 to 8	gallons

In a steam-jacketed kettle at 90° C. melt "A" and then add the triethanolamine stirring constantly. Add "B" slowly and then the boiling water. Stir rapidly till the emulsion is formed and then slowly till cold.

AUTOMOBILE POLISH AND CLEANSER:

A	Water	5	gallons
	Triethanolamine	8	fluidounces
B	Mineral oil	12	pints
	Oleic acid	20	fluidounces
	Abrasive—celite or tripoli	1	pound

Dissolve the triethanolamine in water. In another container mix the oil and acid and stir well. Add "B" to "A" slowly with constant stirring. Then mix in the abrasive.

The above polish and cleanser is applied with a piece of clean cheese cloth, allowed to dry and then rubbed to a bright surface.

METAL POLISH:

I.—Water	15	gallons
Triethanolamine	½	pound
Oleic acid	1	pound
Naphtha	8	gallons
Clay or chalk	5 to 8	pounds
Strong ammonia	1	pint

Dissolve the triethanolamine in the water and then stir in the chalk. In a separate container mix to uniformity the naphtha and oleic acid and add it to the first mixture. When a smooth emulsion has been obtained add the ammonia and stir slowly till uniform.

II.—Talc	2½	pounds
Naphtha	2	gallons
Water	2	gallons
Ceresine wax	1	pound
Turpentine	1	quart

Stir the talc in the water and in another vessel heat together, avoiding open flames, the naphtha, turpentine and wax and stir till uniform. To it add the water and talc mixture and stir to uniformity.

WOOD OR METAL POLISH:

Mineral oil	60 pounds
Cotton-seed oil	20 pounds
Turpentine	10 pounds
Naphtha	10 pounds
Celite	½ to 1 ounce per gallon

The liquid ingredients are stirred together and the celite is then mixed in and the whole stirred till uniform.

Orthodichlorbenzene has been recommended as a cleaner for metals. This material is incorporated with an abrasive such as precipitated chalk to form a paste and is said to be very effective in cleaning silverware, nickel-plated, chromium-plated and other metal articles.

FURNITURE POLISH:

I.—Paraffin oil	3 quarts
Water	15 ounces
Banana oil	3 ounces
Alcohol	15 ounces
Color to suit	

The above ingredients are mixed together, the water being added last.

(Paste Type).—

II.—Carnauba wax	10 pounds
Ceresine wax	10 pounds
Mineral oil	3 pints
Turpentine	5 pints
Varnolene	13 gallons

Melt the carnauba wax together with the ceresine and the mineral oil. When the mixture is uniform add to it slowly with constant stirring a mixture of the varnolene and turpentine. Stir till smooth.

III.—Carnauba wax	10 pounds
Beeswax	4 pounds
Ozokerite	2 pounds
Paraffin wax	2 pounds
Stearic acid	8 pounds
Triethanolamine	5 pounds
Water	25 gallons
Naphtha	11 gallons

Melt the waxes and stearic acid at a temperature of 90° C. in a steam-jacketed kettle and add the triethanolamine. Slowly add the naphtha maintaining a clear solution. Then add the boiling water and agitate strongly to form an emulsion and then slowly till cool.

The following emulsion polish is recommended by the Bureau of Standards for use on pyroxylin lacquers or Duco finishes.

IV.—		
Mineral spirits or gasoline	44	pounds
Beeswax	4½	pounds
Carnauba wax	4½	pounds
Finely powdered diatomaceous earth or tripoli (at least 325 mesh)	2	pounds
Neutral soap	44	pounds

Dissolve the waxes in the gasoline by warming over hot water; add the abrasive to this solution and mix by stirring or shaking; dissolve the soap in the water; add the soap solution to the gasoline mixture, and shake thoroughly. The soap solution should be just warm enough to remain liquid so that the gasoline will not boil out of the vessel. Shake well before applying. This type of polish should be used with care to avoid marring the finish by too vigorous rubbing. Polishes which contain no abrasives are also in use for cellulose ester coatings. The diatomaceous earth or tripoli may be omitted from the above formula.

The following formula is recommended by the United States Bureau of Standards:

V.—		
Cider vinegar	12½	pounds
Petroleum spirits	22½	pounds
Turpentine	13½	pounds
Denatured alcohol	2¼	pounds
Boiled linseed oil	10	pounds
Raw linseed oil	12	pounds

The above quantities make 10 gallons of the polish. It should not be stored in metal containers as the metal will be attacked by the vinegar.

LEATHER POLISH:

Water	16	gallons
Stearic acid	6	pounds
Triethanolamine	2	pounds
Carnauba wax	11	pounds
Turpentine	2	gallons
Dye to suit.		

To the water add the triethanolamine and stearic acid and heat to boiling. In a separate container melt the wax in the turpentine and add the dye. When it is at a temperature of about 90° C. add to the first solution and stir till cold.

SHOE POLISH:

I.—		
Montan wax	5	pounds
Caustic soda	¼	pound
Polish black	½	pound
Nigrosine	1	pound
Water	5	gallons

Dissolve the caustic soda in the water and add the wax. Heat till the wax is melted and then add the two coloring agents. Stir and continue heating until a paste-like consistency is obtained.

II.—		
Carnauba wax	6	pounds
Montan wax	4	pounds
Ceresine	7	pounds
Paraffin wax	4	pounds
Nigrosine	3	pounds
Turpentine	10	gallons

Melt the waxes together and then add to them slowly the turpentine in which has been dissolved the nigrosine. Stir till uniform.

FLOOR POLISH:

I.—		
Carnauba wax	4	pounds
Beeswax	1	pound
Turpentine	1	gallon
Naphtha	4	gallons

Melt the waxes together in a steam-jacketed kettle and then add a mixture of the two solvents. Heat till the solution is clear and stir till cold.

II.—		
Carnauba wax	16	pounds
Stearic acid	1¾	pounds
Triethanolamine	1	pound
Turpentine	3	gallons
Water	7	gallons

Melt the wax and stearic acid together in a steam-jacketed kettle. In a separate container dissolve the triethanolamine in water and heat almost to boiling, and add to it slowly and with constant stirring the melted wax and stearic acid. Then stir into it the turpentine.

(No-rubbing Type.)—

III.—		
Carnauba wax	13	pounds
Oleic acid	1½	pounds
Triethanolamine	2¼	pounds
Borax	1	pound
Water	20	gallons

Using a steam-jacketed kettle melt the wax and add the oleic acid. Stir and add the triethanolamine slowly. Add the borax dissolved in about a quart of boiling water and stir until clear. Then add slowly with constant stirring the boiling water.

MOTH REPELLENT:

Paradichlorbenzene is frequently used in block or crystal form as a moth repellent. The perfumed crystals are made by adding liquid perfume, little by little, to the paradichlorbenzene which has been placed in a mixer, stirring the crystals during the addition. Blocks are made by melting the paradichlorobenzene and casting into molds. Perfume is added to the mass while molten, the mixture being stirred thoroughly.

NAPHTHENATE DRIERS:

Combinations of magnesium, cobalt and zinc with naphthenic acid give driers which are much superior to the old type Japan Driers and in addition give a light color which produces no change in the body. These new driers are more easily standardized and give a pale shade.

NERVE DESENSITIZER:

Dr. Hartman's Solution:

Thymol	1¼ parts
Ethyl alcohol	1 part
Sulphuric ether	2 parts

Keep tightly corked in brown glass bottle. One-half ounce enough for 200 applications.

Use cork or tin lined stoppers only.

OVEN CLEANER:

Carborundum	50 parts
Montan wax	2 parts
Paraffin	5 parts
Cottonseed oil	15 parts
"Nujol"	8 parts
Red oxide of iron	20 parts

PAINT AND VARNISH REMOVER:

The following is a good paint and varnish remover:

Acetone	35 parts
Benzene	40 parts
Methyl alcohol	25 parts
Wax (refined)	4% by weight

Wax is dissolved in the benzene, the acetone and alcohol is added slowly, stirring continuously. This mixture will soften the paint or varnish film in a short time, it may then be scraped off.

REFRIGERATOR DEODORIZER:

A cheap and effective deodorizer is made by taking a pint can, perforating the top and bottom and filling with granular activated carbon. The carbon may be cemented together by mixing with a very small percentage of plaster of Paris which will bind the carbon together in a cake form.

Granular activated carbon functions as an absorber of odors from food, fruit, etc. which prevents an undesirable penetration into other eatables.

REPAIRING PORCELAIN FINISHES FOR PLUMBING FIXTURES, REFRIGERATORS, RANGES, ETC.:

Melt in a suitable container over a gas flame some shellac and add to it titanium oxide until a uniform white mixture is obtained. This can be cast into rods similar to sealing wax. To repair a chip on a porcelain finish warm the previously cleaned spot and apply the mixture. Level off and smooth with sandpaper. Finally, the spot can be coated with a porcelain enamel.

RUSTPROOFING OF IRON:

Parker Process.—The Parker method is carried out as follows: The articles are immersed in a solution which contains 25 grams of phosphoric acid and 1½ grams of manganese dioxide per litre. Boil for 2 to 4 hours. Rinse in warm water, then cold water and dry in sawdust. Brush the articles and heat until water dropped on is thrown off. At this temperature immerse the articles in linseed oil, drain and heat to dryness.

Another process is to boil articles in a solution of 150 grams of calcium hydrogen phosphate per litre until they assume the proper color. Rinse and dry in sawdust. Immerse the articles in heavy oil at 100° F. for one hour. Drain and dry.

SHOE DRESSING, NEUTRAL:

Carnauba wax	8 pounds
Beeswax	5 pounds
Turpentine	8 pounds
Naphtha	8 pounds
Triethanolamine stearate	4 pounds
Water	70 pounds

Heat the mixture of waxes, solvents and triethanolamine stearate, agitate until thoroughly dissolved and then stir until cream.

SHOT-GUN CLEANER:

An efficient cleaner for shot-guns is the following:

"Cellosolve"	2 parts
Acetone	2 parts
Dipentene	3 parts
V.M. & P. naphtha	8 parts
Neatsfoot oil	4 parts

STAINS, REMOVAL OF FROM MARBLE:

(The following has been derived from a publication by the Bureau of Standards.)

Tobacco Stains.—An excellent formula for removing tobacco stains from marble is the following: Dissolve 2 pounds of trisodium phosphate crystals in 1 gallon of hot water. Mix 12 ounces of chlorinated lime to a paste in an enameled pan by adding water slowly and stirring. Pour the two solutions into a stoneware jar and add water until about 2 gallons are obtained. Stir thoroughly, cover the jar and permit the lime to settle. Add some of the liquid to powdered talc until a thick paste is formed and apply a layer ¼ inch thick with a trowel. To apply with a brush instead, add about one teaspoonful of sugar to each pound of powdered talc. If working on polished marble, scrape off with a wooden paddle; if dull marble, scrape off with a trowel. This mixture is a strong bleaching agent and corrodes metals, hence care must be exercised to prevent its dropping on metal fixtures or colored fabrics.

Fire Stains.—The marble may have been discolored from smoke or pitch from burning wood. Scour the surface with powdered pumice to remove any surface deposit, then make up a solution of trisodium phosphate and chlorinated lime as outlined under Tobacco Stains. Fold a white Canton flannel cloth so as to form three or four layers and saturate it in the liquid. Paste this on the stain and cover with a piece of glass or a scrap slab of marble, make sure that the cloth is pressed closely against the marble. Resaturate the cloth as many times as is necessary.

Iodine Stains.—This stain will disappear by itself in a few weeks time. However if it is desired to remove it quickly the following is recommended: Apply alcohol and cover with whiting or talcum powder. For vertical wall stains, mix the talcum to a paste with alcohol, apply some alcohol to the stain and cover with the paste. Normally, one application is usually sufficient.

Perspiration Stains.—Use same method as for fire stains. Bad stains may require several treatments.

Urine Stains.—Use same method as for tobacco stains. If some of the stain is difficult to remove, saturate a layer of cotton batting in the liquid and paste over the spot. Repeat if necessary.

TUNG, OR CHINAWOOD OIL, COOKING:

Raw Chinawood oil gives on drying a crystallized film which is unsuited for paint and varnish manufacture.

Before using in paints, Chinawood oil should be carefully cooked, thereupon it will give a smooth, flexible film. Heat the oil quite rapidly to 500-510° F. and then cool to 425-435°, keep at this temperature until the desired string is obtained, then cool at once, either by water or other means. In the event a thinner is added this temperature may be checked by the thinner. Care must be taken in cooling so that the oil does not jell. Driers or resins may be added if required.

VARNISH FORMULAS INVOLVING THE USE OF SYNTHETIC RESINS:

Phenolic Resin.—There are a large number of phenolic resins on the market which have been modified to meet special requirements. They are usually compounded with glyceryl phthalate, ester gum or natural resins. The manufacturer of varnishes should consult with the resin producer to insure using the correct resin for his particular purpose.

Phenolic Resin	100 pounds
Chinawood oil	25 gallons
Kettle bodied linseed oil	8 gallons
Mineral spirits	35 gallons

Add cobalt and manganese drier.

Heat the chinawood oil with the phenolic resin to 550° F., keep at this temperature for ½ hour and check with the linseed oil, mineral spirits and added driers.

Four-Hour Varnish.—The following is a good four-hour varnish:

Coumarone resin	100 pounds
Chinawood oil	25 gallons
V. M. & P. naphtha	40 gallons
Lead-cobalt-manganese drier	1/10% metal based on oil

Cook the oil to 550° F. together with ½ the coumarone, keep at this temperature for 30 minutes; check with the remainder of the coumarone. When cool enough, add the V. M. & P. naphtha and drier.

Spar Varnish.—May be made up as follows:

Ester gum	100 pounds
Chinawood oil	220 pounds
Lead acetate	2 pounds
Cobalt drier	10 pounds
Linseed oil	1 gallon
V. M. & P. naphtha	65 gallons
Turpentine	5 gallons

Heat the chinawood oil plus ½ the ester gum to 550° F. and keep at this temperature for ½ hour, check with the lead acetate dissolved in the linseed oil and the remainder of the ester gum. At 425° F. add solvents and drier.

Linoleum Varnish.—

Phenolic resin	100 pounds
Chinawood oil	25 gallons
Mineral spirits	35 gallons

Heat to 500° F. for 30 minutes, check with mineral spirits. This gives a good water and alkali-resistant varnish suitable for floors and linoleum.

Vehicle for Aluminum Bronzing.—

Coumarone resin	100 pounds
Preheated chinawood oil	10 gallons
Xylol	7 gallons
V. M. & P. naphtha	18 gallons

Dissolve the resin in xylol and naphtha, then add chinawood oil and drier.

WATERPROOFING, WALL (EXTERIOR):

Paraffin wax dissolved in volatile sulvents is considered to be very efficient. For finer pore walls the addition of small amounts of fatty oil is suggested. This treatment will produce discolorations of an oily appearance. The melting-point of the wax should be high enough to prevent its flow during the summer months. Usually wax having a melting point of 135° F. is suitable.

The Caffall process for waterproofing walls is often used where durability is the prime requisite; the cost is somewhat higher than that of various other methods. The process consists of preheating the walls and then applying molten paraffin. This process may be used on damp walls.

There are many other means that are also recommended. An inexpensive mixture which is reported as being very durable is the following:

6 to 12 ounces high melting-point paraffin dissolved in
1 gallon of solvent

The solvent may be naphtha, gasoline or the like. The above formula is not suited for structures that have fine pores; the addition of 3 to 6 ounces of chinawood oil to the gallon of solvent will yield a satisfactory solution for application to fine-pore walls.

The waterproofing treatments should be applied only when the walls are dry and clean and in warm weather. It is advisable to continue the application of the solutions until there is no further absorption—this will likewise insure maximum penetration. Undue discolorations may be avoided by the removal of excess wax after concluding the treatment.

Another well known method, Ransome's process, is also used. This process consists in filling the pores of the stone with potassium or sodium silicate and permitting to dry, next a coat of calcium chloride is applied (using a different brush). Care must be taken to avoid dropping the solution on windows or painted surfaces.

WOOD PRESERVATION:

Creosote Oil.—Creosote oil is an effective and economical wood preservative which also provides protection against wood-destroying insects. It gives a brown stain, penetrates deeply and protects the inner wood as well as the outer. It does not evaporate—even at unusually high temperatures, will not dissolve in water, and has remarkable weather durability. One coat is usually all that is needed; however two coats are advisable in order to insure maximum service. Of course dried-out wood will require somewhat more oil for complete penetration than is ordinarily necessary. The creosote may be applied by immersion in a tank if desired.